Claim 10 provides a process for producing a ternary metal colloid, said ternary metal colloid comprising metal nanoparticles composed of three different metal elements and having a three layer core/shell structure, the process comprising the steps of:

> producing a solution in which first metal ions are dispersed in a solvent by dissolving a first metal salt into a first solvent, and producing a first colloid solution by reducing the first metal ions;
> providing first metal nanoparticles in the first colloid solution with an activity as a reduction catalyst;
> producing a second metal salt solution by dissolving a second metal salt into a second solvent, and mixing the first metal nanoparticles with the second metal salt solution and reducing second metal ions to form a binary colloid solution;
> providing second metal nanoparticles in the binary colloid solution with an activity as a reduction catalyst; and
> producing a third metal salt solution by dissolving a third metal salt into a third solvent, and mixing the second metal nanoparticles with the third metal salt solution and reducing third metal ions.

Claim 11 provides a process for producing the ternary metal colloid, said ternary metal colloid comprising metal nanoparticles composed of three different metal elements and having a three layer core/shell structure, the process, comprising the steps of:

> producing a first metal salt solution in which two metal ions are dispersed in a solvent by dissolving two metal salts into a first solvent, and producing a colloid solution comprising metal nanoparticles which is composed of two metal elements and has a core/shell structure by reducing the two metal ions in the first metal salt solution;
>
> providing the metal nanoparticles in the first colloid solution with an activity as a reduction catalyst; and
>
> producing a second metal salt solution by dissolving one metal salt different from the two metal salts into a second solvent, and mixing the metal nanoparticles with the second metal salt solution and reducing metal ions in the second metal salt solution.

Shizuko (JP11-241107A) does not teach or suggest the sequence of steps required by either of claims 10 or 11. With regard to claims 10, 12, the combination of Shizuko and Wang, et al does not teach the sequence of forming first metal ions, then reduce, then apply second metal ions, and then reduce again, then apply third metal ions, then reduce again. With regard to claims 11, 13, 14, the combination of Shizuko and Wang, et al

does not teach the sequence of forming a first + second metal ions then reduce, then apply third metal ions, then reduce again.

Shizuko discloses producing a solution containing a plurality of metal ions, and reducing the same to prepare a metal colloid solution. The resulting colloid solution is added with another colloid solution to produce a multicomponent colloid solution. The Examiner asserts that the sequence of addition of reducing agents does not really matter in determining inventive step. The Examiner asserts that although Shizuko does not teach the sequence of steps presently claimed, there are no new or unexpected results exhibited by the present claims. Applicants strongly disagree. It is urged that the method taught by Shizuko, where a reducing agent is added to a solution containing a plurality of metal ions, would not produce a colloid having the particularly desired three layered core/shell structure of the present claims. Specifically, when a reducing agent is added to a solution containing a plurality of metal ions, each metal ion *is not* reduced at the same time. Instead, ions of metals having lower ionization tendency are preferentially reduced and deposited. For example, a reduction agent is added to a solution where Pt ion and Pd ion coexist, since Pd which has a lower ionization tendency will be preferentially reduced, thus forming a Pd/Pt (core/shell) colloid, with Pd being the core and Pt covering the core. Thus, it is very difficult to produce a colloid having the opposite combination, i.e. Pt/Pd (core/shell). Additionally, it is submitted that Shizuko's method of simply mixing different metal colloids would not produce a multicomponent colloid of preferable morphology. That is, simply mixing a Pt colloid and a Pd colloid would not allow the Pd colloid to be the core. Furthermore, even if a Pt colloid were adsorbed around the Pd colloid, it would be difficult to form a Pt shell layer in a uniform manner.

In contrast, the present invention easily produces a multicomponent colloid having a desirable structure, since metal ions are added to a colloid which has been provided to a surface having a reduction ability due to a contact with a reducing agent, namely hydrogen. Providing such reduction ability to the Pt colloid and adding a Pd ion to the Pt colloid results in the production of a Pt core and a Pd shell covering the Pt. Additionally,

since the metal ion of course has a smaller particle diameter than that of the colloid and thus has a better dispersibility, the metal ion will adhere to a core colloid and be reduced upon adhesion. Thus, a uniform shell layer can be formed. By the particular regulation of timing of adding a reducing agent according to the present claims, a colloid having a combination which has not been produced conventionally may be easily produced with high quality. Such is not taught or suggested by the cited art.

Clearly, Shizuko does not teach or suggest the presently required sequence of producing a ternary metal colloid, by dispersing first metal ions in a solvent followed by reducing and providing first metal nanoparticles in the first colloid solution; dissolving a second metal salt into a second solvent, and mixing the first metal nanoparticles with the second metal salt solution and reducing second metal ions to form a binary colloid solution and providing second metal nanoparticles in the binary colloid solution with an activity as a reduction catalyst; and then dissolving a third metal salt into a third solvent, and mixing the second metal nanoparticles with the third metal salt solution and reducing third metal ions. Furthermore, while Wang, et al. teaches the use of hydrogen as a reducing agent, however, this reference is silent about adding hydrogen to a *reduced colloid* and with which *other metal ions* should make contact. Thus, it is urged that even a hypothetical combination of Shizuko and Wang, et al. would still fail to obviate the present claims. For all of the above reasons, Applicants respectfully submit that the 35 U.S.C. 103 rejections of claims 10-14 should be withdrawn.

The undersigned respectfully requests re-examination of this application and believes it is now in condition for allowance. Such action is requested. If the examiner believes there is any matter which prevents allowance of the present application, it is requested that the

undersigned be contacted to arrange for an interview which may expedite prosecution.

Respectfully submitted,

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I hereby certify that this paper is being facsimile transmitted to the United States Patent and Trademark Office (FAX No. (571) 273-8300) on October 7, 2009

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